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No. 2—Sterility in the Mare Associated with Irregularities of the Oestrous Cycle*

F. T. DAY, M.R.C.V.S.

SCHOOL OF AGRICULTURE, CAMBRIDGE

Although the yearly infertility in mares is very high—40 per cent. in heavy mares and 33 per cent. in thoroughbreds—the number of mares which remain permanently sterile is comparatively small, so that the main causes of sterility are temporary.

In any group of mares, barrenness results from four main causes: inappropriate time of mating during oestrus, irregularities of the oestrous cycle, the use of a stallion of low fertility, and abnormal conditions of the genital tract.

Hammond (1938) found that ovulation occurred about 24 hours before the end of oestrus, independent of the length of oestrus and that the highest percentage fertility resulted from matings made two to four days before the end of oestrus.

Kedrov (1938) found that matings made within 24 hours before ovulation gave the best results, whereas services earlier than 48 hours before ovulation were unsatisfactory.

The effect of time of mating on fertility is also shown by a comparison of different groups of mares under different systems of management. Ponies running wild, free to mate at any time, have a yearly fertility record of over 90 per cent.; thoroughbreds at stud, covering their mares two or three times on alternate days in each oestrous period, get on the average 66 per cent. of them in foal, and the heavy horses which cover their mares when they visit the farms once a week independent of the time in oestrus get 59 per cent. of their mares in foal.

These percentages are averages for a large number of stallions covering a far larger number of mares, but in successive years, with different groups of mares, there is a marked variation in the fertility records of individual stallions. Some consistently get 70 to 85 per cent. of their mares in foal, the majority get 55 to 70 per cent., while others seldom get more than 50 per cent., and a few are sterile.

Since sterility is dependent on the number and activity of spermatozoa in the semen, in horses with comparatively few weakly-motile sperm there is less chance of the sperm surviving in the genital tract of the mare for any length of time and they are only fertile to matings made close to the time of ovulation, whereas horses with a large number of active spermatozoa in each ejaculate have a much greater chance that some of the sperm will survive in the genital tract of the mare until ovulation occurs and services made earlier in oestrus will be fertile.

Under the heading of abnormal conditions of the genital tract causing either temporary or permanent sterility, the two main conditions encountered are aspiration of air through the vulva, and subinvolution of the uterus following parturition, abortion, or retention of foetal membranes. As a result of these conditions, secondary infections occur with various organisms, mainly haemolytic streptococci, giving rise to clinical conditions variously described as vaginitis, cervicitis, metritis and endometritis.

Subinvolution of the uterus recovers spontaneously after several months provided there has been no structural damage to the cervix, and is usually only responsible for a mare remaining barren for the year in which it happens.

Aspiration of air through the vulva, may be primarily due to the shape and conformation of the vulva, or it may be secondary to injuries of the vulva at a previous parturition. It is the cause of sterility in over 50 per cent. of mares which have remained barren for three or four

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years. Caslick (1937) has given a very good description of the causes, symptoms and treatment of the condition, and emphasises both the difficulty and importance of recognising the condition as the primary cause of what is so often diagnosed as an infected mare, or a mare with metritis.

It is necessary to stress the importance of diagnosing aspiration of air through the vulva, for it can be readily corrected. The operation of suturing the upper commissure of the vulva gives rapid and successful results, the most severe cases recovering completely in about six months.

Other abnormal conditions of the genital tract are of comparatively little importance, and include abnormal conditions of the cervix and cervical canal due to trauma at parturition, pyometra due to adhesions of the cervix, uterine leucorrhoea and immature non-functional genital organs.

The Oestrous Cycle

On a well-managed breeding stud, where there is veterinary supervision of the mares, and where the management of stallions, and the matings of mares, are given great care and attention, the main causes of yearly infertility are irregularities of the oestrous cycle, but before dealing with the abnormal, it will be better to describe the normal changes taking place in the ovaries, and the normal variations in the oestrous cycle.

The normal breeding season for mares is the spring and summer months, and while some mares continue to come in oestrus throughout the year, most of them go into anoestrus during the winter months. Mares well fed and stabled usually tend to come in oestrus throughout the year, while those out at grass go into anoestrus.

In mares which are in anoestrus in winter, there is a tendency for them to have long oestrous periods of ten to 15 days, when coming out of anoestrus in the early spring, and some will remain in oestrus for 40 to 60 days, particularly if they are in relatively poor condition with long coats, and grass and sunshine are late. Mares remaining in oestrus for a long time tend to have long dioestrous periods, 18 to 30 days, but as the season advances both oestrus and dioestrus shorten until by May most mares are having a normal cycle of six days' oestrus and 15 days' dioestrus.

The oestrous cycle is governed by changes taking place in the ovary, which are under the control of the pituitary. Pituitary secretions stimulate follicle development in the ovary, as a result of which one follicle matures and ovulates. There are probably two substances which produce this effect: the first, a follicle-stimulating secretion, is responsible for the growth of follicles, and the second, having a luteinising effect, causes ovulation and the formation of the corpus luteum.

Mares come in oestrus as a result of *oestrone* secreted in the ovaries when the follicles reach a certain rate or level of development; after ovulation and the formation of the corpus luteum, the latter secretes *progesterone* which sensitises the uterus so that the embryo becomes attached, and which is responsible for the dioestrous period.

The minimum functional period of the corpus luteum appears to be 13 days, and the time from the thirteenth day of dioestrus to the time when the mare comes in oestrus depends on the time taken for a follicle to reach that rate of development which is necessary for the manifestation of oestrus.

Mares which have foaled usually come in oestrus five to seven days after parturition, and remain in oestrus for five or six days.

There is not so much variation in the length of oestrus and dioestrus in the foaling mare as in the barren and maiden mare. This may be due to the fact that foaling mares are always in better condition than the others at the beginning of the season, and the pituitary only functions normally when mares are in good bodily condition.

Changes in the Ovary during Oestrus and Dioestrus

By measuring follicles in ovaries *post-mortem* and by palpating ovaries *per rectum*, it is possible to estimate the size of the follicles from rectal palpation and follow changes in the ovary. During anoestrus the ovaries are small and bean-shaped, and in the thoroughbred mare are approximately 6 cm. long, 4 cm. deep and 3 cm. wide. Ovaries at this time feel quite hard to the touch and the surface is quite even.

Just before oestrus, one to a number of follicles come up in one or both ovaries and can be palpated along the convex border of the ovary or at one end, usually varying in size from 1 to 3 cm. diameter. (See Fig. 1.) By the first day of oestrus, usually one follicle can be palpated larger than the others and about 2·5 to 3·5 cm. in diameter. During oestrus one follicle gradually matures to ovulation size which varies from 3·0 to 7·0 cm., and as this one follicle matures, the others, which started to develop, regress. While the follicle is maturing it feels tense and firm and can only be identified as a follicle by its spherical shape and size until about 24 to 48 hours before ovulation, when there is a gradual reduction in intra-follicular pressure and the follicle feels quite soft and fluctuating.

Immediately after ovulation, the collapsed walls of the follicle feel soft and flabby and an indentation can be felt on the surface of the ovary. Within the next eight hours the

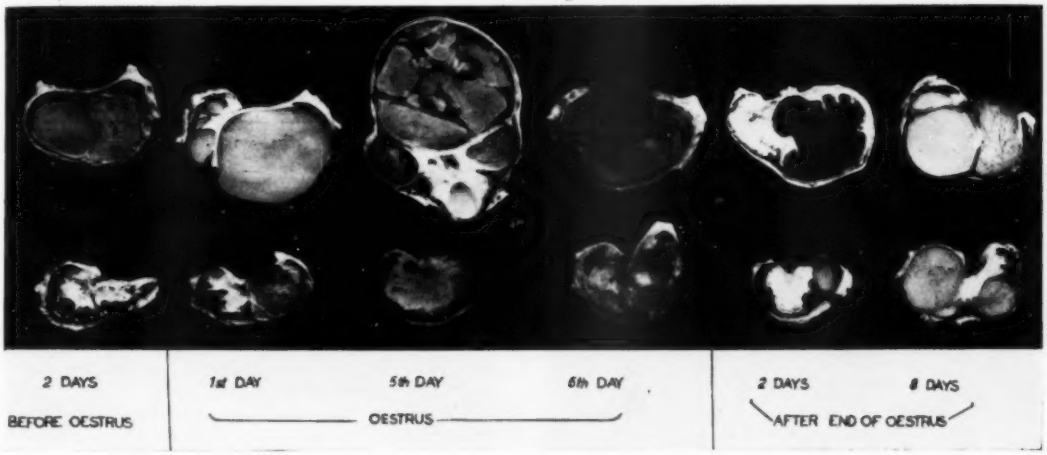

FIG. 1.—Sections of ovaries of normal mares showing changes in the oestrous cycle.

collapsed walls of the follicle fill with blood, and at this stage the ovary feels spongy and similar to a freshly clotted haematoma. In the next 24 hours there is a gradual hardening of the freshly formed corpus luteum and by 72 hours after ovulation, the corpus luteum can no longer be distinguished from the rest of the ovarian tissue.

From *post-mortem* examination it has been found that ovulation always takes place through the ovulation fossa, and probably the length of oestrus is dependent on the time taken for the follicle to mature until its lower border reaches the ovulation fossa. After ovulation, mares only remain in oestrus about 24 hours, although slight variations occur.

By the time ovulation occurs the smaller follicles which were developing early in oestrus have usually regressed and are comparatively small, but occasionally a follicle 2 to 3 cm. remains. Under the influence of the corpus luteum, these soon regress and after an interval of 4 to 9 days from the end of oestrus, no follicles over 1 cm. are palpable in either ovary.

Changes in the Vagina and Cervix during Oestrus, Dioestrus and Anoestrus

In dioestrus, the cervix is tightly constricted and erect. The vagina and cervix are a pale pink in colour, and the mucin is scanty and rather tenacious to the touch. In oestrus there is a gradual increase in the vascularity of the vagina and cervix, the mucin is more plentiful and is quite fluid and slippery to the touch, but the most marked change is the gradual loss of tone of the cervical muscles.

All these changes commence gradually from the onset of oestrus and become more marked as the time of ovulation approaches, when the cervix is completely relaxed and can be seen lying on the floor of the vagina, often with the folds of the cervix appearing somewhat oedematous. After ovulation there is a gradual return to the typical changes of dioestrus.

In anoestrus, as in pregnancy, the vagina and cervix are very pale, having a blanched appearance; the cervix is constricted, usually turned away from the midline and the external os is occluded by very sticky mucin in the anterior vagina and cervix.

Irregularities in the Oestrous Cycle and Associated Conditions of the Ovaries

The *post-mortem* appearances of ovaries from mares with normal and abnormal oestrous cycles, vary considerably. Follicles of all sizes are seen, some normal, some showing degeneration of the granulosa cells and in some cases the theca. Corpora lutea are seen in all stages of development and regression but usually only one recently formed one is found. In normal mares, the findings in the ovary correspond to the changes already described, according to the time in the oestrous cycle.

In abnormal mares it is seldom that a corpus luteum is found; the ovaries vary in the numbers and sizes of follicles they contain, and in the number showing varying degrees of degeneration. What are generally referred to as "cystic ovaries" are ovaries in which the follicles have not behaved normally. They reach various degrees of maturity, but do not ovulate, some persist, some regress, and others keep coming up and going down, but ovulation does not take place. Cystic ovaries are diagnosed clinically, if in the interval of three to nine days after the end of oestrus one or more follicles from 2·5 to 5·0 cm. are present, or when large follicles of 3·5 to 6·0 cm. are present in the ovary together with the typical dioestrus appearance of the vagina and cervix. If mares have cystic ovaries one year and go into

Fig. 2.—Sections of ovaries. Lower ovary showing fresh corpus luteum 95 hours after ovulation following injection of gonadotrophic hormone.

Fig. 3.—Tubal ovum recovered from same mare 95 hours after ovulation.

anoestrus in the winter the cysts regress and disappear. Mares having an irregular oestrous cycle in one season, often behave regularly in the next, although there is a tendency for a mare while she remains barren to have the same type of oestrous cycle in successive years. From these findings it can be seen that treatment both of cystic ovaries and of irregular oestrous periods, must be carried out during the breeding season.

Irregular oestrous cycles can be split up into groups; those commonly occurring in foaling mares, and those in barren and maiden mares. The commonest irregularities in the foaling mare are prolongation beyond the ninth day of the onset of the foal heat, and very long dioestrous periods following the foal heat. The former condition is very common if the mare is in rather poor condition. A long dioestrous period frequently lasts until the foal is weaned, when it is disconcerting to find a mare which was thought to be in foal, in oestrus.

It is probable in both these conditions that heavy lactation is responsible for the mares not coming in oestrus. As a rule there are no follicles in the ovaries or there may be only small ones up to 2·0 cm. in diameter.

In a few cases foaling mares may stay in oestrus a long time, perhaps ten to 20 days; in such cases ovulation does not usually take place. The follicles regress, the mare goes off, and comes in oestrus again in about seven to nine days, and then has a normal oestrous period. Sometimes foaling mares will behave quite regularly for three or four oestrous cycles and will then have a long oestrous period, or may fail to come in oestrus again although not in foal. In these cases, the mares have failed to conceive from some other cause yet they have been showing normal oestrous periods; then due to the scar tissue caused by several successive corpora lutea, a follicle which matures, fails to ovulate, persists and becomes cystic. (See Figs. 4 and 5.)

In the barren and maiden mare the commonest troubles are long oestrous period and failure to come in oestrus. The main cause of this is that in commercial horse breeding, breeders try to get mares in foal before their normal breeding season commences. Oestrus may last for ten to 15 days, dioestrus 18 to 30, and in successive cycles both oestrus and dioestrus shorten, but it is usually the latter part of May before the normal cycle of six days oestrus and 15 days dioestrus occurs.

If mares remain in oestrus from 30 to 60 days they may eventually ovulate and then behave normally, or the follicles may regress, the mares going off for about seven days and coming on again. Oestrus in these cases does not tend to shorten until a corpus luteum is formed; after this they usually return to a

Fig. 4.—Sections of cystic ovaries.

Fig. 5.—Sections of cystic ovaries.

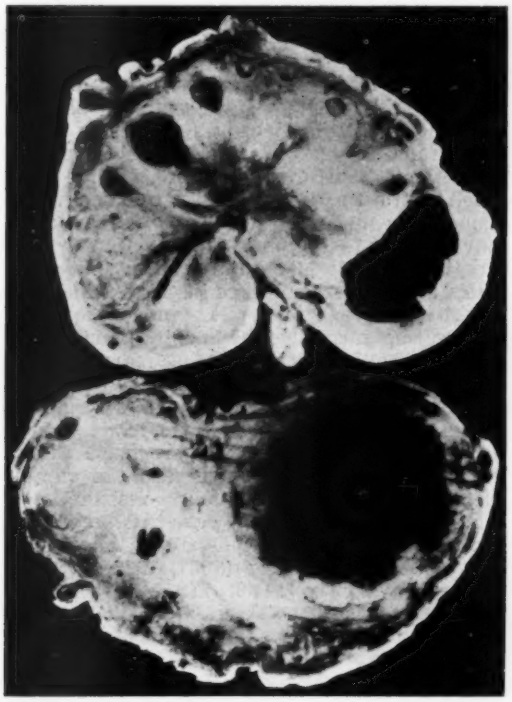

Fig. 6.—Sections of ovaries. The lower ovary showing luteinisation of follicle without ovulation.

normal cycle, but in a few mares ovulation does not take place, and follicles persist and become cystic.

In the mares staying in oestrus for 30 days or more a number of follicles can be palpated of varying sizes, either multiple small ones up to 2·5 cm. or one or two larger ones 3·0 to 4·0 cm. in size.

The mares which fail to come in oestrus are usually of two types; the first are like those having long oestrous periods, relatively poor in condition with long coats, and on palpation there are no follicles in the ovaries, or only very small ones up to 1·0 cm. in size. With these mares, and with mares showing a long oestrous period, it is probable that a subnormal pituitary stimulation is responsible, particularly as both types of mares usually come in oestrus normally by the latter part of May.

The other type of mare which does not come in oestrus is the over-fat mare, the type of mare that puts on flesh on a starvation ration. These mares occasionally have a short oestrous period of about three days without ovulating, but as a rule they never come in oestrus. On palpation usually one to three follicles from 3·0 to 5·0 cm. are found in one or both ovaries. If these mares are followed through the breeding season these follicles are found to persist and become cystic, and while they are present,

other follicles will come up and go down, without reaching either the size or rate of development necessary to cause oestrus.

Another troublesome group of mares comprises those which ovulate regularly, showing all the physiological changes of oestrus in the vagina and cervix, but which will not show the physiological manifestation of oestrus when tried with a teaser. Mares like this behave the same way in successive years either when barren or as foaling mares. The only way they are bred at all is by the stud groom seeing them show to other mares in the paddock and by the fact that they relax and are quiet in the serving yard when he handles them behind. When there is doubt about these mares being in oestrus, a vaginal examination should be made, and if the typical changes of oestrus are present, and there is a follicle in one of the ovaries of 3·0 cm. or more, the mare can be served. This condition, and also the varying degrees of receptivity and resistance of different mares in their reactions in oestrus and dioestrus to the stallion have been described by McKenzie (1937, 1938).

Mares vary so much in their individual manifestations of oestrus, that it is often necessary for an experienced stud groom to have a mare under his care for one or two oestrous cycles before it is possible to decide by the mare's behaviour to the teaser stallion whether she is in oestrus.

From a consideration of these details it appears that irregularities of the oestrous cycle and cystic ovaries are usually the result of abnormal pituitary stimulation, although in a few cases cystic ovaries appear to occur as a primary condition, when old luteal tissue prevents ovulation, and in mares which ovulate regularly but fail to show symptoms of oestrus to the stallion it is probably the ovary which is responsible for a low level of oestrone secretion during oestrus.

Treatment of Cystic Ovaries and Irregularities of the Oestrous Cycle

Puncture of Follicles and Cysts.

This operation is performed with the mare in the standing position and the only restraint needed is a twitch, and a truss of hay behind the mare. The ovary is held with one arm in the rectum, and with the other hand a trochar (see Fig. 7) is introduced into the vagina. This hand is pushed well forward and the trochar is thrust into the follicle or cyst. The mare does not appear to experience any pain from the actual operation, but if the suspensory ligament of the ovary is strained by pulling the ovary back the mare does appear to suffer pain.

If the follicle has almost reached ovulation size, that is 3·0 to 5·0 cm., and the granulosa has not degenerated, puncturing the follicle results in the formation of a corpus luteum,

Fig. 7.—Instrument used for puncturing ovarian cysts.

and if this is the case it is followed by a normal dioestrous period and a return to a normal cycle.

If the follicles are small, or if the granulosa has degenerated, no corpus luteum is formed and the puncture of these follicles does not alter the cycle, except that if the mare is in oestrus at the time of puncture, she will go off for a few days, until other follicles come up to the same stage of development. If the follicle or cyst is large, and no corpus luteum is formed as a result of puncture, but another follicle comes up in the next ten to 20 days, puncturing this follicle when it has reached 3·0 to 5·0 cm. in size is invariably followed by the formation of a corpus luteum, and a return to a normal cycle.

Puncturing follicles or cysts is only likely to be successful when there are only one or two present in the ovaries of 3·0 to 5·0 cm. in size; and the mare's subsequent cycle should be followed to find if puncturing a second time is necessary.

Treatment with Gonadotrophic Hormones.

There are two types of gonadotrophic hormones which can be used, one mainly luteinising in effect, the other mainly follicle-stimulating.

The preparations used by the author have been physostab and antuitrin S., which are extracts of pregnancy urine, and antostab and serogan which are extracts of pregnant mare serum. The first two have a luteinising effect and the latter are follicle-stimulating.

In mares with one or more matured follicles of 3·5 to 6·0 cm. in size, the intravenous injection of 1,000 to 3,000 rat or mouse units of physostab or antuitrin S. will cause ovulation in 30 to 60 hours independent of the time in the oestrous cycle, providing the granulosa of the follicle has not degenerated. This ovulation has been shown to be normal by the recovery of a tubal ovum (see Figs. 2 and 3) in a mare which was destroyed after the artificial induction of ovulation (Day, 1939). Following ovulation and the formation of the corpus luteum, there is a normal dioestrous period and a return to the normal oestrous cycle.

If mares are continually in oestrus, and the ovaries have multiple small follicles up to 2·5 cm. in size the intravenous injection of these hormones has no effect, but if 500 mouse units are given subcutaneously for three to six successive days, luteinisation of the small follicles takes place without ovulation, the mare goes out of oestrus, has a normal dioestrous period, and returns to a normal oestrous cycle.

Neither physostab nor antuitrin S. appears to have any follicle-stimulating effect when given intravenously or subcutaneously, and if an intravenous injection is made in a mare with a large follicle but not in oestrus, and ovulation occurs, no symptoms of oestrus appear.

In mares which fail to come in oestrus, either normal mares without follicles in their ovaries, or mares which had large cystic ovaries, and which failed to come in oestrus after puncture of the cysts, the subcutaneous injection of 500 mouse units of antostab for four or five successive days or of 1,000 mouse units antostab for two or three days usually results in the mares coming in oestrus in three to five days, and if injections are discontinued at the onset of oestrus in most cases the mares ovulate normally.

Some mares come in oestrus in three to five days following one subcutaneous injection of 2,000 rat units serogan in oil, but the results are not so satisfactory as with repeated daily injections of an aqueous solution.

The individual response of mares to the injection of follicle stimulating hormones varies. Some mares come in oestrus in a few days and ovulate normally, while others ovulate without coming in oestrus. Some come in oestrus, a follicle matures, does not ovulate, but either regresses or becomes cystic, and in a few mares no follicle growth takes place at all.

These irregular results are not surprising, as individual mares probably vary considerably in the amount of follicle stimulating and luteinising hormone required to make up the individual deficiencies of their own pituitaries.

The same dosage of follicle stimulating hormone already mentioned has no effect when given to mares in anoestrus during the months from November to February.

It is probable that these injections are the minimal doses for inducing follicle growth in mares' ovaries, and those mares which do not respond to them probably need a larger dose. It has been found with small laboratory animals that the individual requirements of some animals may be ten times that of others of the same species.

From these remarks it appears that during the breeding season, a great deal could be done in the treatment of cystic ovaries and irregularities of the oestrous cycle by the judicious use of the operation for puncturing cysts and the injection of gonadotrophic hormones.

Summary

The yearly infertility in mares is about 30 to 40 per cent. of those bred, but permanent sterility is not very common.

The main causes of barrenness are inappropriate time of mating, use of a stallion of low fertility, irregularities of the oestrous cycle and abnormal conditions of the genital tract.

On a well-managed breeding stud, irregularities of the oestrous cycle are the chief causes.

Cystic ovaries and irregularities in the oestrous cycle are mainly the results of abnormal pituitary stimulation.

This results partly from mares being in poor unthrifty or over-fat condition, and also through serving mares before the normal breeding season.

A description is given of the changes which take place in the ovaries and genital tract in the mare during a normal oestrous cycle, and in mares with irregular cycles.

Operative treatment for puncturing ovarian cysts is described, and methods for controlling oestrus and ovulation by injection of gonadotrophic hormones are discussed.

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DISCUSSION

Mr. Day's paper was the first to be discussed by Congress, N.V.M.A., at the session held in the Town Hall, Great Yarmouth, on the morning of Tuesday, July 25th, 1939.

Mr. H. H. Truman, M.R.C.V.S. (March, Cambridgeshire), presiding over a large attendance, briefly introduced the essayist and then called upon Professor Craig, who, with Mr. Brayley Reynolds, was to open the discussion.

Professor J. F. Craig, M.A., F.R.C.V.S. (Liverpool): In opening the discussion on "Sterility in the Mare associated with Irregularities of the Oestrous Cycle," my first duty is a very pleasant one. It is to compliment Mr. Day on his very real and important contribution to our knowledge of the oestrous cycle in the mare. It is evident that Mr. Day has had plenty of material at his disposal and has made excellent use of it as is obvious from the good progress that has been made.

In the comments I have to make on the subject of the paper, nothing that I shall say is intended to detract from the valuable observations of Mr. Day. My remarks may and will show, however, that although much progress has been made there is still a great hiatus in our knowledge of animal breeding which cannot yet be regarded as an exact science.

In his preliminary statement Mr. Day gives some idea of the immensity of the problem of equine sterility by noting the yearly percentage of infertility in different breeds of mares. I have gathered together some statistics which agree with those given in the paper with regard to thoroughbred mares. They covered a period of four years from 1925 to 1928 and I append them in the following table:—

	1925	1926	1927	1928
Colt foals ...	1,726	1,720	1,779	1,902
Filly foals ...	1,667	1,740	1,729	1,852
Abortions ...	76	83	97	105
Twins	86	90	82	77
Barren mares ...	1,661	1,799	1,923	1,966
Total of mares	5,216	5,433	5,610	5,902
Sterile mares ...	31%	33%	34%	33%

An interesting sidelight of the survey was the very low frequency of abortions. The percentage in each year was never greater than 1·7.

It was also noted in that survey that the barrenness in the mares was for the most part temporary, *i.e.*, that the mares remained barren for only one of two seasons. But, of course, it has to be admitted that if mares were not breeding, economic considerations would prevent their continuance at stud for an indefinite time.

As regards cart mares and ponies, I have been unable to find statistics which are comprehensive enough and which demonstrate beyond doubt the yearly infertility rate. At the same time, I accept the statement that it is higher for cart mares than thoroughbreds and that in ponies running wild the sterility rate is very low. Nevertheless I am not inclined to accept as the whole explanation of the high fertility record in ponies running wild the freedom of mating, and therefore the greater likelihood of mating at the appropriate time, *viz.*, at or near ovulation.

It is not improbable that a hereditary fertility factor may have a bearing on the great difference in the fertility records of thoroughbreds on the one hand and ponies running wild on the other.

In the case of thoroughbreds, the mares kept for breeding are selected for their stamina and speed and pedigree, but no attention is paid to the fruitfulness of the families to which they belong.

If ponies are running wild, it is obvious that where there is no selection, the most prolific will become the most numerous and the families which are not fruitful will tend to become smaller and even die out.

It is known that some mares will not breed every year and it might be possible to gain some reliable information on this point by reference to the thoroughbred stud book. It should be possible to determine to some extent whether a hereditary fertility factor is involved in the breeding of horses as in other species of animals and also, if it occurs, in what proportion of cases. Apart from that it must be admitted that a large percentage of sterility is caused by other factors which are or are likely to be made preventible or curable.

Mr. Day refers to the fertility records of stallions as having a bearing on the sterility of mares and everyone will agree that that aspect must be taken into consideration. In some instances the percentage fertility of an individual stallion is adversely affected by the number of barren mares sent to him for service.

One usually takes it that the fertility of the stallion is related to the number and activity of the spermatozoa in the semen but that is not always the case although it may be regarded as a rule. I remember examining the semen of a stallion whose services were never fruitful and yet the semen was exceedingly rich in active, apparently normal, spermatozoa. I admit, of course, that that is likely to be a rather uncommon experience. Although it is stated that the number and vitality of spermatozoa in the semen of the stallion may be increased by improved feeding, by vitamin E and moderate exercise no improvement is likely to be effected where the semen contains few or no spermatozoa.

In the examination of a mare which has been barren for one or more seasons a careful rectal and vaginal examination is made and this is coupled with the taking of uterine swabs for bacteriological investigation. Sometimes in endometritis a catarrhal discharge may be noted only during oestrus or is more marked at that time, and if no swabs are taken in the absence of discharge endometritis may escape detection. Haemolytic streptococci, diphtheroids and staphylococci are not uncommon in genital infections in the mare and are probably admitted from the external passage owing to improper or delayed involution of the uterus after parturition and through wind sucking. The latter condition is very refractory to ordinary treatment especially when the uterus becomes dilated. The operation adopted by Caslick and others appears, however, to be attended with great success and the power to breed returns in the following season.

So far as abortion is concerned, judging from the statistics which I have brought forward, it cannot be regarded as a common factor in the production of endometritis. Certainly the want of contraction of the uterus has a serious adverse effect on recovery from endometritis but whether subinvolution of the uterus without endometritis is itself responsible for sterility requires clarification. I have seen a mare which was barren for three seasons in which the only changes found were a flabby condition of the uterus and the os uteri so greatly dilated that the fist could readily be passed into the uterus. When that mare was put out to grass and given a course of tonics, the os uteri contracted normally and next season after service it proved to be in foal.

I notice in his paper that Mr. Day seems to draw a distinction between endometritis and leucorrhoea, and I have no doubt that he has a very good reason for differentiating. Perhaps, however, he would be good enough to give us his views on the point.

And now let me come to the main theme of the paper, the oestrous cycle and its irregularities. It is true that a very large proportion of barren mares have no infection of the genital tract and it is the solution of this problem that is the main purpose of Mr. Day's paper. He has made very accurate observations which are worthy of careful study. He notes the great variations which occur in the length of the oestrous periods and the external evidence of oestrus, correlating these with the changes in the ovaries and the genital passages. The variations are ascribed to differences in the potency of the gonadotrophic hormones and in the oestrone which are secreted by the pituitary gland and the ovary respectively.

When thinking of these secretions one naturally wonders what starts the machinery going and whether the production of the hormones is affected by food and other factors influencing the body economy. It is known that very fat animals are often barren and that foods, sunlight and exercise all contribute to success in breeding. When the breeding season is short and confined to the earlier portion of the year, the cold weather, scarcity of grass and limited sunlight will obviously have an adverse effect and may do so by retarding the essential hormone production. Moreover the genital hormones are closely related in their function and action with the hormones of other glands like the thyroid and suprarenal. These considerations may be at the moment purely theoretical, but obviously they seem to point in a general way to the root cause of the trouble.

In the examination of the ovaries of the mare a very great difficulty is experienced in distinguishing an ovarian cyst from a well-developed Graafian follicle. One often finds several in the same ovary and their interpretation is not easy. Mr. Day has solved the difficulty but only by requiring two examinations and noting when oestrus has been present.

I was rather impressed some years ago when I examined the pregnant uterus and ovaries of two mares *post-mortem*. The uterus contained a foetus about 50 or 60 days old and the ovaries contained what appeared to be several cysts, presumably Graafian follicles, about the size of hazelnuts or somewhat larger. I had thought then the corpus luteum would have entirely inhibited the maturation of the Graafian follicles.

Again it is interesting to learn that many so-called cysts disappear during anoestrus.

Moreover in chronic endometritis a cystic condition of the ovaries is not uncommon.

When one examines the mare's ovary during life, another intriguing feature is the corpus luteum. In the cow the corpus luteum is readily distinguished, but in the mare its recognition is very difficult. It may be that one portion of the ovary which is solidly enlarged may give a clue as to the presence of a yellow body recently formed although that feature could not be regarded as distinctive.

The other point I want to comment upon is the evidence of oestrus in the mare. It is now clear that service is likely to be successful only if the mating takes place at or near to the time of ovulation. The presence of oestrus is often recognised only in the presence of the teaser, the stallion or other mares.

Supposing that these trials are negative, does Mr. Day recommend as a routine measure an examination of the vagina or even of the ovaries to determine (1) if the animal is in oestrus and (2) if ovulation is occurring? If so, how often should the examination be made?

At the present time after a mare is sent to stud, it is usually tried every second or third

day and one would suppose that under the circumstances in most cases the favourable period for service would be found.

If one looks up the dates of service one notes great irregularities in the time of service after parturition and when repeated in the succession of services.

I have here the dates of services of 50 mares, including 30 foaling mares. Of these nine were served once only on the 7th to 11th day, three on the 26th to 29th day, two on the 37th to 41st day after foaling, while others were served once, twice or three or more times later at varying periods up to 55 and even 95 days. In barren mares of which I have records the services were even more irregular. Here is one served on March 29th and 30th; it was again served in 5, 22 and 43 and 46 days afterwards. Here is another served first on March 2nd and 4th, served again on the 45th and 46th days, and on the 61st and 96th days. These facts point to the presence of irregular oestrous periods.

Mr. Day gives very clearly the indications for puncture of cysts and for the use of gonadotrophic hormones. Most of us have tried some preparation containing the hormones in the absence of oestrus or ovulation with a varied degree of success. Perhaps some of the successes were mere coincidences. However, one must confess that a good case has been made out for the employment of Physostab or Antuitrin "S" and Serogan according to indications regarding the oestrous cycle. Perhaps Mr. Day will amplify the results and give the actual number of cases treated and the number of mares which have become pregnant after treatment.

In view of other experiences it has become apparent that hormone preparations must be employed sparingly and that their continued employment will create antisubstances which will defeat the objects for which they are given.

At the present moment one will be more than satisfied if one can with a fair measure of certainty induce those changes which will make for success in breeding.

In conclusion I should like again to express my very high appreciation of this valuable contribution of Mr. Day's to the very complex problem of equine sterility. If it is possible to increase the fertility rate by, say, 15 or 20 per cent., then these and other investigations will have brought a great recompense for the time and money expended on them.

Mr. E. Brayley Reynolds, O.B.E., M.R.C.V.S., Newmarket, who was the second opener of the discussion, said: In the first place I would like to congratulate Mr. Day very heartily upon the paper which he has presented to us. I am, too, pleased to congratulate Professor Craig on his opening remarks: they make my task much lighter and enable me to confine my own observations to the reactions the reading of the paper made on my mind as a general practitioner.

Mr. Day very naturally had to introduce his subject with some general remarks upon sterility and in these he mentions that in any group of mares barrenness results from four main causes, and the first one he mentions is: Inappropriate time of mating during oestrus. In support of this cause he quotes certain percentages of fertility observed in different groups of animals under different systems of management. Although Professor Craig has referred to this variation in fertility observed in the various classes of mares I am tempted to make some further observations on it, more particularly in regard to the thoroughbred mare.

Naturally the figures Mr. Day quotes are only used in a general sense and for large numbers of animals. That they may be substantially correct for the travelling stallion as an indication of a proportion of infertility being due to inappropriate time of mating during oestrus would appear to be self-evident from the conditions under which these animals have to perform their duties, but that they represent a correct comparison as between the wild pony and the thoroughbred, as at present managed, I very much doubt. There are other factors which must be taken into account. In the first place, is it not highly probable that the wild pony mare living under more natural conditions than her thoroughbred sister is considerably less subject to those other causes of infertility? Professor Craig has referred to a possible hereditary factor in this respect. And in regard to the thoroughbred mare one cannot ignore that owing to their potential value a very much larger proportion of doubtful breeders, including those actually suffering from abnormal conditions of their genital tract and some actually sterile, are maintained as breeding propositions than is the case in other breeds. This is well exemplified by observing the relative percentage fertility of mares grouped according to the service fees of the stallions with which they are mated. The higher the fee of the stallion, provided of course it is itself not of proved low fertility, apparently the higher the percentage of fertility of the mares visiting it. The explanation of this would appear to be simple, namely, that the mares mated with a high-priced stallion are for the most part picked animals. Any owner is reluctant to pay a high fee for the service of a mare about which there is a doubt as to her being got in foal. It is not meant to infer by this that these stallions never have a doubtful mare on their list. There is always the possibility of any mare going wrong in any season; and there are always exceptional circumstances that prompt owners to take the risk. One can assume therefore that the per-

centage of fertility might easily be even higher than it now is.

The doubtfully breeding mare gradually descends the scale to a lower-priced stallion, and in this way may fall into a somewhat vicious cycle, for it is more likely to meet the stallion which by reason of its own low fertility has descended in the scale of fees.

To illustrate this point it might be mentioned that the records of five high-fee stallions standing at one stud some four or five years ago showed that their fertility, as assessed by the number of mares in foal to them, was about 85 per cent., and that this figure had been more or less stable over a number of years. And again, taking the returns of four stallions at one stud over the five seasons ending 1938, a 79 per cent. fertility was shown.

Although it would serve no strong support of this argument, which is on general lines, to quote specific instances of very high fertility of a single stallion in a particular year, yet it might be of interest to refer in passing to one or two. In the season 1938 one thoroughbred stallion left, as far as my information is at present, 40 mares out of 41 in foal, *i.e.*, 97·56 per cent.; and another four years ago left 30 out of 31 in foal, 96·77 per cent.

I have dealt with this point at some length in support of the present system of management of thoroughbred stallions, although I am quite prepared to admit that some modifications in it could be introduced with very beneficial results to the mares and to the horse.

In the first paragraph of his paper Mr. Day makes the statement: "The number of mares which remain permanently sterile is comparatively small, so that the main causes of sterility are temporary." With this I fully agree: and it is a particularly important factor, for this should offer the greatest encouragement of all to those who are so diligently endeavouring to wrest from nature her secrets of the complicated endocrine, and possibly nervous, mechanism whereby she maintains the perfect equilibrium so essential in the process of procreation.

The percentage of the various classes of mares that are barren each year remains about the same, but the actual mares that are barren differ. It is probably correct to say that in previous discussions there has been much confusion over this point. It is the yearly percentage of infertility that one would wish to see lower.

In support of this temporary character of sterility it would perhaps be of interest to quote some figures obtained from the Thoroughbred Stud Book. The figures are in two groups: Group "A" relates to mares mated in the years 1923, 1924 and 1925 (5,547 mares were mated in 1924), and Group "B" in the years 1927, 1928 and 1929 (5,599 mares mated in 1928).

Number of consecutive years barren.	Number of mares proving in foal. Group "A"	Group "B"	Total.
2	343	395	738
3	72	97	169
4	23	31	54
5 and over	8	13	21
Total	446	536	982

(N.B.—These figures do not include mares sold abroad, died before foaling or for which no return was made.)

The figures for mares that had been barren for five consecutive years and over are rather remarkable, and speaking from personal experience of such cases they would appear to indicate that provided there has been no irreparable injury or loss of any part of the genital apparatus of the mare one is rarely justified in expressing a definite opinion that a mare is permanently sterile, no matter how long she has been barren or how hopeless she may appear. The exceptions probably would be those in which some permanent ovarian dysfunction had been established.

A fact that may be of very material importance is that in the groups of mares referred to above approximately 10 per cent. of them had foals either dead at birth or which died shortly afterwards.

Mr. Day briefly refers to some abnormal conditions of the genital tract, and among them the intaking of air through the vulva. I am sure Mr. Day will forgive me if I remark that I would like to see the use of the word *aspiration*, for describing this condition, abolished: for it is the *passing in* of air that is the harmful factor. The great importance, as Mr. Day so rightly points out, of this very common act, especially in the barren mare, although the foaling mare is by no means exempt, cannot be too highly or too often emphasised.

Although the comparatively simple operation for closure of the upper part of the vulva does give extraordinarily good, and in some instances very rapid, results I doubt somewhat but that the view inferred by Mr. Day is a little too optimistic. The view he has expressed may be correct when in-taking of air is the primary cause of the existing trouble, but there are diseased conditions of the genital tract, quite apart from those the result of injuries and conformation, which, in my view, give rise to the in-taking of air.

Professor Craig has dealt with most of the points arising under irregularities of the oestrous cycle, which is the main theme of Mr. Day's paper. I would merely remark that I consider one of the most important that Mr. Day establishes is the diagnosis of cystic ovaries, the

diagnosis of which has in the past been much too loose. The point Mr. Day makes in regard to this is the presence of one or more follicles in the ovary during the interval of three to nine days after the end of oestrous, or the existence of large follicles when the vagina and cervix are showing a typical appearance of di-oestrous—thus showing the necessity for the careful attention that should be paid to a mare's oestrous periods in diagnosing ovarian abnormalities.

Professor Craig has referred to a hereditary factor. I, too, would wish to know whether there is any definite indication of a hereditary tendency more particularly in regard to irregularities of the oestrous cycle.

In summing up Mr. Day's paper one fact would appear to stand out as self-evident, namely, that it is totally impossible in a very large proportion of cases to come to anything like a definite diagnosis of the cause of barrenness in mares by making a single examination, and more particularly when this is made outside the breeding season and unaccompanied by an intimate history of the case: a procedure unfortunately still too prevalent in this country.

The necessity for repeated examinations and the tax this would impose on a busy practitioner's time was quite ably referred to in an editorial in the *Record* of May 6th last, and the institution of a system of local area hospitals was mentioned. The close attention and repeated examinations and treatments that must be carried out would practically render it necessary that animals would have to be collected at one place to enable them to be dealt with, with any prospect of success, even by anyone giving his whole time to this work.

This phase alone of treatment, if accompanied by investigation into animal disease, surely is a strong argument for establishing field hospitals in connection with the teaching institutions as outlined in the Loveday Report, for quite apart from the benefit that would follow extended research into the problem a possibly greater benefit would be the practical teaching of the student on these matters, which is now almost non-existent. In any case I sincerely trust that the start that has been made, will be continued, for it is certain that research has not yet brought our knowledge of this subject to a state even approaching any degree of finality.

In conclusion I feel sure it is the wish of every member of the National Veterinary Medical Association that to the congratulations to Mr. Day you would wish me to add our thanks and congratulations to the Thoroughbred Breeders Association, which, by supplying the means, enabled these researches to be carried out.

The Chairman now rose to say that they had had two very learned and lucid dissertations from Professor Craig and Captain Brayley Reynolds and he was afraid that at that point he would have to close the discussion on account of the shortage of time remaining at their disposal. He was sure they were very anxious that Mr. Day should have plenty of opportunity to reply to the points raised by the openers of the discussion.

The Reply

Mr. Day said that he must thank the assembly for the very kind way in which they had received the paper and particularly for the opening of the discussion contributed by Professor Craig and Mr. Brayley Reynolds. He had several notes and would try to reply to the queries raised.

Both speakers had dealt with the yearly fertility of thoroughbreds compared with heavy breeds and ponies and he was pleased that Mr. Reynolds had relieved him of the duty of explaining the various factors concerned which contributed to the fertility results under the different forms of management.

Most of the yearly infertility in both thoroughbreds and heavy breeds was temporary, and only a few mares remained permanently barren. Mr. Reynolds had also quoted some interesting figures on this point which duly served to emphasise how few mares remained permanently sterile. With thoroughbred horses which had proved themselves bad foal-getters and were standing at a high fee, the mares going to such horses would be regular breeding mares, and these horses usually had a considerably good record of 75 to 85 per cent. yearly fertility.

The management with regard to the time of mating in oestrus in studs where horses like this were standing could not very well be improved, and most of the mares which remained barren did not breed either through having an irregular oestrous cycle or from some cause other than an inappropriate time of mating. The normal breeding season for mares was from April to the end of July, but with thoroughbreds, in an effort to get early foals the breeding season commenced in February and ended in June.

In the first two months of the season very few of the maiden and barren mares were having oestrous periods of normal duration, with the result that these mares did not have a reasonable chance of getting in foal until the end of April and May, and if, as with ponies running wild, the season was extended to the end of July, he felt quite sure that a great number more mares would get in foal than they did now.

Professor Craig had mentioned the part played by heredity, but he (Mr. Day) did not think it was worth going into any detail on that side. Both mares and stallions were selected for breeding on their performances either on the

racecourse or at work, and while horse-breeding was a commercial business he was afraid that they would not persuade owners not to breed from animals which were good from that point of view, and it had just to be left to natural selection to eliminate those mares and stallions of lowered fertility.

With regard to the differences in fertility of stallions, taken over a number of years, and also the seasonal difference, there were horses of all grades of fertility, and the fertility of any individual stallion would depend on the number and activity of the sperm in an ejaculate. Feeding and general management could influence fertility very greatly and, of course, there were many things which might result in a stallion becoming relatively infertile in any one year.

It was extremely difficult to assess the fertility of stallions by examination of sperm collected in an artificial vagina.

It was easy to say if a horse was fertile or sterile, but there did not appear to be any correlation between volume, density and activity of sperm as judged by the eye, with the different grades of fertility. Walton and Edwards (1939) have shown that fertility of bulls could be correlated with sperm activity when measured with a respirometer, and when a series of ejaculates were taken and tested in a short interval, and it was probable that the result would be the same from stallions. The difficulty arose in judging activity by the eye under a microscope immediately after collection of the sperm, as this was influenced so greatly by the outside temperature.

It was only safe to say that if the volume, density and activity of the sperm are good, it is reasonable to assume that the stallion is of good fertility, but from one examination it would be impossible to predict whether any horse would get 60 or 80 per cent. of mares in foal.

With a horse of low fertility, or for that matter any horse, it was advisable to make more than one examination as there were often considerable variations in different ejaculates although on the average of a number of ejaculates stallions were fairly consistent.

One case could be mentioned of a horse which never had more than 40 per cent. of his mares in foal, yet with repeated examination of sperm, volume, density and activity appeared to be quite normal.

Mr. Day was pleased Mr. Reynolds had stressed the importance of the plastic operation on the vulva with mares which were sucking air through the vulva.

He (the speaker) would be converted by Mr. Reynolds to re-naming the condition of aspiration of air through the vulva, intake of air through the vulva, but the recognition of the condition was the important point.

Professor Craig had questioned the usefulness of the operation. He (Mr. Day) thought he knew what was at the back of his mind. If one operated on a mare which had been barren for several years, there was a risk that at foaling the mare would again tear the vulva. This did occur sometimes, and it was advisable to warn the owner of the mare of the possibility, so that if the mare did tear the vulva at foaling, it could be sutured again as soon as possible.

Professor Craig had asked the difference between uterine leucorrhoea and metritis; metritis was an inflammatory condition of the genital tract, whereas with leucorrhoea of the uterus there was no evidence of any inflammatory condition. It was very common for men at slaughterhouses to find mares with the uterus full of a thick creamy-white discharge; that discharge was a mass of leucocytes, and the mucous membrane quite normal. Leucorrhoea of the uterus appeared to be associated with irregularities of the oestrous cycle, as in two cases in mares which had cystic ovaries, the discharge completely cleared up a few days after ovulation had been induced by the injection of gonadotrophic hormones.

Professor Craig mentioned finding a large ripe follicle in a mare's ovary together with a 40-day foetus. During the first 60 days of pregnancy a number of large follicles came up in the ovaries, and became luteinised, so it would be a normal finding for that stage foetus.

Professor Craig also asked how the time of ovulation could be recognised in mares which did not show the usual manifestations of oestrus when tried with a stallion.

This would be possible by making rectal and vaginal examinations. The vaginal examination was the simplest. In dioestrus the cervix was constricted and erect, the vagina was a pale pink, and there was very little mucin present. In oestrus the vagjna and cervix were more reddened, mucin was plentiful and the cervix was relaxed. Confirmation of these findings could be made by palpating a large follicle or one of the ovaries. In difficult mares, an examination could be made once a week until the time was found.

Too frequent examinations of the vagina with a speculum were not advisable, and the same effect could be produced that was seen in mares sucking air through the vulva.

Professor Craig also questioned the use of hormones, and said that repeated use might have the opposite effect to that desired. He (Mr. Day) agreed with him to this extent, that if one wished to use one of the pituitary extracts to induce oestrus, and the first two injections failed, it might be necessary to increase the dose very considerably to get the desired result later.

He (Mr. Day) had injected several mares repeatedly with relatively large doses of the

same and different hormone preparations, but the subsequent oestrous cycles of those mares were quite normal, showing that the continual administration of hormones had no lasting effect on the mare's own cycle. The mares had since bred, which removed further suspicions.

There were different hormones which gave different results, either mainly luteinising or mainly follicle-stimulating, and the results with either were never 100 per cent. in producing the desired effect in treating irregularities of the oestrous cycle.

He had heard that time was drawing short and he would therefore conclude by saying that it was essential that a great deal more work should be done in the treatment of irregular cycles with gonadotrophic hormones, as those were our most hopeful weapon for treating such conditions. He would take that opportunity of asking veterinary surgeons if they would be good enough to get in touch with him if they had any mares with some of the abnormal cycles described, and he should be pleased to help or advise them about treatment of the mares if he could hear the subsequent results. A very large number of mares would have to be treated before further conclusions could be made.

The Chairman said that he was afraid he had to cut Mr. Day's reply somewhat, which he much regretted. It was not usual to pass any formal vote of thanks from those meetings but he was certain it was their wish that Mr. Day should be accorded a hearty vote of thanks both for his excellent paper and for his most informative reply. (Loud applause.)

CIVIL SERVICE AND THE UNIVERSITIES

"Considerable interest is being shown by the Civil Service staff associations in the proposal, mooted at last month's meeting of the National Whitley Council, to invite members of university teaching staffs to take temporary posts as administrative principal officers in the Civil Service for two or three years," states the Civil Service correspondent of *The Times*.

"The proposal was made by the official side on the grounds that there is at present an enormous increase in the work for which principal officers are required, and that the grades from which these officers are normally promoted have been thoroughly combed for promotees.

"The staff side expressed the view that it was doubtful whether the universities would be able to supply the type of officer required for the work, and they considered that there were large sections of the Civil Service containing numbers of officers with suitable qualifications and experience who had not been considered as candidates at all. The staff associations undertook to supply lists of candidates from which principal officers could be selected. The official side indicated that the matter was urgent and that they wished to approach the universities immediately, but they undertook to consider any names supplied by the staff side."

The Veterinary Record

September 9th, 1939.

From the President, N.V.M.A.

War, 1939 to 19—

I AM sure that when my biographer referred to me as the first post-War graduate to be President of the National Veterinary Medical Association he did not imagine that within a month we should be at war again. But then, on reflection, who, having experienced the last war, would have imagined that any man could be so crazy as to embroil the world in a fresh one 21 years later? Methods of warfare change and it is not yet apparent what part our profession may be called upon to play during this conflict. Veterinary surgery has been placed amongst the "reserved occupations" and members will not at this stage be requested to serve in His Majesty's forces in a non-veterinary capacity. Those who, when they recently registered, volunteered for service either at home or elsewhere may be called upon to act as emergencies arise. We understand, however, that whole-time officers of the Ministry of Agriculture and Panel A inspectors will be expected to remain at their posts. No information is yet available from the War Office as to its intentions concerning the profession.

Already many veterinary surgeons will have been appointed, in an honorary capacity, by the National Air Raid Precautions Animals' Committee to organise A.R.P. work in their respective districts. This committee, on which three of our members are serving with Colonel Stordy as Chief Executive Officer, has, during the past two weeks, done a prodigious amount of work. At present the arrangements are confined to the evacuable areas, but they will be extended as rapidly as possible. In the meantime we would make a special appeal to our members to undertake the work of A.R.P. for animals in their own districts. For the guidance of members we would refer them to A.R.P. Handbook No. 12 and to the booklet, to which reference is made in our Notes and News columns, just issued on behalf of N.A.R.P.A.C. by the National Veterinary Medical Association.

The present crisis affords a golden opportunity for members of the veterinary profession to work in close co-operation with the animal

welfare societies, and it will, I am sure, be the sincere desire of all, that this close co-operation will result in mutual appreciation of the others' work. The N.V.M.A. has placed its offices at 36, Gordon Square, at the disposal of the N.A.R.P.A.C. and our permanent staff is giving every assistance. In view of this fact our staff will remain at 36, Gordon Square for the present; later if their position there becomes untenable, the business of the Association and *Veterinary Record* will be transferred to the Midlands for the duration of the war.

We hope to be able to continue to publish the *Veterinary Record* each week, though it will probably be necessary to reduce its size.

The work of the Association will continue and a sub-committee is actively engaged in the preparation of a simple scheme for the protection of the practices of absentee practitioners which we hope will be acceptable to our members. This scheme, like any other of a similar nature, must depend for its success on mutual trust and goodwill, but we hope through the good offices of the Divisions to be able to facilitate the arrangements.

It would seem inevitable that many of the schemes which I had hoped to have seen brought to fruition during my year of office will of necessity have to be postponed, but members may rest assured that we shall do our best under the circumstances. On behalf of the officers of the Association I should like to assure members that we are ready and willing to render them any assistance which we are able under the special and difficult conditions which have now arisen.

H. W. Steele-Bodger.

The Government has appointed Mr. Sidney Foster, general manager of the Milk Marketing Board of England and Wales, as director-designate of supplies of milk.

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According to the report on the fur farms of Canada for 1937 recently issued, the number of fur farms recorded in Canada during that year was 9,179, an increase over the preceding year of 1,037, or 13 per cent. Included in the total are 7,601 fox farms, 1,426 mink farms, and 152 farms whose classifications comprise marten, fisher, racoon and other species. Compared with 1936, fox farms in 1937 showed an increase of 544, or 8 per cent.; mink farms, an increase of 514, or 56 per cent., and farms other than fox or mink, a decrease of 21, or 12 per cent.—*Farming News.*

CLINICAL COMMUNICATION

Haemorrhagic Septicaemia (?) in the Bovine: A Case for Diagnosis

JOHN M. BUCHANAN, M.R.C.V.S.
Glasgow

I was greatly interested in the notes on haemorrhagic septicaemia by Messrs. Foggie and Lamont in the issue of the *Veterinary Record* of August 12th. A case I met with in Wales may be of topical interest to them and others.

The subject was a two-year-old Shorthorn bull grazing on rough hill pasture. When called to see him he had been passing large blood clots in the faeces. The temperature was 108° F., the pulse small and thready and the animal was breathing fast. A large dose of prontosil was given and mustard applied to relieve the apparent congestion of the lungs. Bismuth in two-ounce doses to be given in flour gruel was left.

On visiting in the evening the temperature was 104° F. and the bull slightly easier. Several large blood clots had been passed—all formed in the faeces and marked by the peristalsis of the bowel—and each being, at first sight, not unlike a mucoid slough. The animal died in the early hours of the morning.

Post-mortem examination showed acute colitus, the colon being full of blood clots and faeces. The heart wall and the lungs also, showed petechial haemorrhages. No pneumonia was present.

My colleague, Mr. D. H. Thomas, of Whitland, suggested bracken poisoning more in an endeavour to find a cause than as a serious attempt at nomenclature. There was no evidence of bracken in the stomachs. Other opinions would be appreciated.

Work carried out by the Wye College Pig Husbandry Research Station indicates that the milk in the posterior teats of a sow is inferior in quality to that from the anterior four teats. In 16 out of 20 litters examined it was found that piglings sucking the four teats at the fore end of the udder made more growth during the nursing period than those sucking the four at the posterior end. In the case of small litters it was found that the piglings invariably selected the teats at the fore end of the udder.—*Farming News.*

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Except for those who get into trouble, and are sent to an approved school for training, there is no ready-made channel for the town boy to the farm. Yet there should be. The Board of Education and the Ministry of Agriculture could with advantage consult on this problem.—*The Times.*

ABSTRACTS

[The Causes of the Increased Incidence of Tuberculosis in the Calf and Pig. (Trans. title.) Bougert, J. G. (1938.) *Deuts. tierärztl. Wschr.* 37 and 38. 579, 599.]

The author discusses the efficiency of the holding method of pasteurisation adopted in Germany for the destruction of tubercle bacilli. He contends that heating milk at 60 to 63° C. for 30 minutes is not effective and quotes the experiments of the *Reich-Gesundheitsamt* in support of his view. When calves and young pigs were fed on milk treated at this temperature it was found that a number contracted tuberculosis and the lesions were manifested chiefly in the thoracic cavity. [It may be pointed out that similar results have occasionally been obtained by commercial pasteurising plants used in this country, but it has been found in these instances that the exact temperature and time was not rigidly carried out. It is imperative, therefore, that the efficiency of pasteurisation should always be checked by a test such as the Graham-Kay phosphatase test.]

S. J. E.

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[Changes in the Rumen in Foot-and-Mouth Disease. (Trans. title.) Oppel, R. (1938.) *Arch. Tierhlk.* **74.** 1-24. 12 plates.]

Following the examination of the rumens of 21 cattle which had been suffering from foot-and-mouth disease, the author describes in great detail the macroscopical and microscopical changes which occur on the non-papillated portions of the mucous membrane. These changes may be summarised as follows:—

(1) Vesicle formation similar to the characteristic lesions of the mouth and feet.

(2) Two types with no vesicle formation (*a*) erosion of the deeper layers of the mucosa with hyaline degeneration, (*b*) demarcation of the superficial epithelial layers with scab formation.

Secondary bacterial invasion of these diseased areas may lead to extensive ulceration and necrosis.

W. M. H.

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[I.—Colic in the Horse and the Weather. (Trans. title.) Ullmann, G. (1938.) *Arch. Tierhlk.* **74.** 117-123; **II.—Colic and the Age of Horses.** (Trans. title.) Neumann-Kleinpaul, K. (1938.) *Ibid.* 124-126.]

These are statistical analyses of colic cases treated at Berlin Veterinary School, in the first for the period 1928 to 1936 and in the second from 1935 to 1937.

Results are mostly given in tables and graphs. Ullmann deals with 4,712 cases of colic: it was most frequent in the hot months of July and August on an average, though one year most cases occurred in September and in another year in January.

Neumann-Kleinpaul deals with 1,302 colic cases, of which close on one-half were caecal colic. Ten cases of colic were in the 1 to 5 years age group; all recovered. Fifty were in the 6 to 10 years group; 44 recovered. One hundred and ninety-two were in the 11 to 15 years group; 164 recovered. Two hundred and forty-two were in the 16 to 20 years group; 176 recovered. Finally 70 cases were over 20 years old, 49 of them recovering.

It is concluded that caecal colic particularly is a disease of ageing horses and prognosis becomes less favourable in old age.

J. E.

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[Clostridium welchii: Notes on the Relationship between the Type of Culture and the Production of Toxin. Dalling, T., and Ross, H. E. (1938.) *J. comp. Path.* **51.** 235-249. 3 tables. 28 refs.]

Four types of *Cl. welchii* have been described by Wilsdon and these produce varying amounts of five different toxins, *viz.*:—

Culture types	*Toxins*				
	α	β	γ	δ	ϵ
A	+	−	−	−	−
B	+	+	+	±	+
C	+	+	+	+	−
D	+	−	−	−	+

Whilst individual cultures within a type may vary in their ability to produce toxins, such factors as the nature of the culture medium, the *p*H and the length of incubation have been found to affect the potency of the toxins produced in artificial media.

In enterotoxaemia of sheep, especially in lamb dysentery, whilst it is usually sufficient to identify the type of toxin present in the alimentary canal, too much reliance must not be placed on this test in concluding the infecting type of *Cl. welchii*. It is also emphasised that in the protection of sheep and lambs against an infection associated with *Cl. welchii* group, prophylaxis against all types of toxin should be carried out unless careful tests have shown that only a certain type of organism is causing the infection.

J. S. P.

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[An Outbreak of Psittacosis at the London Zoological Gardens. Troup, A. G., Adam, R., and Bedson, S. P. (1939.) *British Med. J.* Jan. 14th. 51-55.]

It has been considered probable that latent infection has always been present in the parrot

house of the Zoological Gardens, and virus was isolated from two out of eight parrot spleens examined in 1930, but no cases of psittacosis had been recognised amongst keepers till 1938. In that year a consignment of parrots was received from South America, kept in the sanatorium for a few days and then transferred to the sanatorium room of the parrot house. Six members of the parrot-house staff had access to this room and five of these men contracted psittacosis with one death. Two parrots of the South American consignment died and two of the old parrot stock. The remaining birds of the imported stock and the birds in contact with the cases in the old stock were destroyed. In some of the birds and in one human case virus was detected by sub-inoculation of mice, the other human cases being detected by the complement fixation test.

As a result of this outbreak it has been decided to impose three months' quarantine on all newly acquired parrots arriving at the Zoological Gardens, and to adopt rigorous sanitary measures in the collection and disposal of their excreta. It is thought that a quarantine period of three months would allow time for a heavy infection to declare itself, and it is pointed out that attendants should wear rubber gloves, masks and goggles.

U. F. R.

EXPERIMENTS ON LIVING ANIMALS

A Home Office return relating to experiments on living animals (Stationery Office, 1s.) shows that the total number of experiments performed during 1938 was 958,761, or 39,801 more than in 1937. The number of experiments performed with anaesthetics totalled 49,915, being 9,596 more than in 1937. The number of experiments comprising inoculations, hypodermic injections, and other proceedings performed without anaesthetics was 908,846, 30,205 more than in 1937.

Of the 49,915 experiments performed with anaesthetics, comprising all the cases in which any serious operation was involved, 14,797 were performed under licence alone or under certificate C, and therefore came under the provision of the Act that the animal must be kept under an anaesthetic during the whole of the experiment. The experiments performed without anaesthetics—908,846 in number—were mostly inoculations and feeding experiments. In addition, a certain number consisted of oral administrations, inhalations, external applications, and the abstraction of body fluids.

A large number of experiments, almost wholly simple inoculations and similar proceedings, were performed either on behalf of official bodies, with a view to the preservation of the public health, or directly for the diagnosis and treatment of disease. Over 183,000 experiments were reported by 365 licensees as having been performed for Government Departments, the Medical Research Council, county councils, municipal corporations, or other public health authorities.

REVIEW

[**Nutrition and the Public Health.** Proceedings of a National Conference on the Wider Aspects of Nutrition, April 27th-28th-29th, 1939. (London, British Medical Association, B.M.A. House, Tavistock Square, W.C.1. pp. 150. Price 2s. 6d.).]

At the conference organised by the British Medical Association to deal with the wider aspects of nutrition, there were present, in the chairman's own words, "More able and distinguished experts than had ever been gathered together to discuss this particular subject," and although the delegates as such lacked executive powers, it was hoped that extra-murally much might be achieved in improving the present nutritional status of the community. A number of the papers, including those dealing with the medical and veterinary aspects of nutrition, have already appeared in these columns, and there can be no doubt of the impressive nature of the contribution of our own representative. The local assessments of physical standards and dietary standards may vary, but it is clear that several millions of our population are suffering from, or incurring, the effects of serious malnutrition, and all must endorse the resolution of the conference urging the Government to formulate a long-term food policy and to instigate an educational campaign with the aim of increasing the consumption of "foodstuffs desirable on nutritional grounds." Unfortunately, any such policy must take into account the present international situation, while transcending even this is the question of the relative production and consumption of foodstuffs at home and abroad, and particularly within the Empire, where there would appear to be ample room for readjustment. Such politico-economic considerations seem rather remote from either the research worker or the general practitioner, but they do not detract from the more immediately serious revelations of the conference. Indeed, from the veterinary viewpoint, malnutrition and livestock production are vital questions not only to the nutrition worker, but also to country practitioners, investigation officers and inspectors, and it is to be hoped that many among the latter categories will see their way to purchase these proceedings, which may be obtained from B.M.A. House at the modest sum of half-a-crown.

Dr. Ian C. Mackay, Medical Officer of Health for Cheshire, in his annual report, states that there are in the county 27 attested herds, 2,862 accredited milk licences, and 65 tuberculin-tested licences.

N.V.M.A. DIVISIONAL REPORTS

Eastern Counties V.M.A.*

SUMMER MEETING AT GREAT YARMOUTH

At the kind invitation of Mr. and Mrs. Shipley, the Summer Meeting was held at "Beechcroft," Southtown, Great Yarmouth, on Tuesday, July 4th, 1939.

In addition to the President, Mr. Shipley, there were present: Messrs. F. Blakemore, T. E. Barcham, J. Buckingham, B. A. Claxton, J. M. Currie, W. Dennett, T. Dalling, W. F. Howes, E. S. James, W. F. Loveless, H. V. Low, G. H. Leader, M. Senior, H. P. Standley, Jun., J. F. Thurston, T. F. Tunney, P. R. Turner and R. P. Webber. Messrs. J. Poles and H. E. Bywater were present as visitors.

At the outset of the meeting, the President drew the members' attention to the great loss they had sustained in the deaths of Sir F. Hobday, Messrs. B. W. Blomfield and W. Turtill. As a token of respect the members stood silent for a few minutes. The Secretary was requested to write to the relatives expressing the sympathy of all members of the Society.

The minutes of the last meeting, as published in the *Veterinary Record*, were taken as read and signed.

Correspondence.—(1) From the following members regretting their inability to be present: Messrs. M. Bray, R. Crawford, H. Downe, F. L. Gooch, T. G. Heatley, J. Hammond, G. T. Matthews, G. Muir, C. C. Nesling, N. F. Pollock, S. Poles, E. B. Reynolds, H. P. Standley, Sen., H. Swann, W. H. Wortley, R. R. Welling and P. Welch.

(2) From Mr. A. V. Franklin, Colonel W. A. Wood and Mr. A. M. MacDonald tendering their resignation from membership. It was decided that these be accepted with regret.

(3) From the N.V.M.A. in reference to quack remedies for the treatment and cure of contagious abortion and sterility in cattle.

(4) From the N.V.M.A. regarding A.R.P. measures for animals. A small sub-committee consisting of the President, Messrs. B. A. Claxton, J. Currie, S. E. Hill, Major E. S. James and the Hon. Secretary was elected to deal with this question.

(5) From Messrs. Bayer Products, Ltd., offering to show various veterinary films. The Secretary was requested to write Messrs. Bayer Products thanking them for their kind offer, and also to make arrangements for one or more of these films to be shown at the next meeting.

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Auditors.—Messrs. T. E. Barcham and T. F. Tunney were unanimously elected auditors.

The Secretary was requested to write Mr. H. Buckingham a letter of sympathy on account of his illness, with an expression of gratitude for his services rendered to the Association as one of their Auditors for many years.

New Members.—Miss A. M. B. Copithorne and Mr. F. Day were elected to membership of the Association.

Next Meeting.—It was decided that the Autumn Meeting should be held at Ipswich on October 13th.

Presidential Address

The President (Mr. Shipley) now gave the following address from the Chair: It is customary at this meeting for the President to give a Presidential address but as this meeting is devoted chiefly to sociabilities I do not propose to give a lengthy one.

I must thank you very much indeed for bestowing on me this honour, especially as this year the Congress is being held here. On the last occasion that it was held at Yarmouth my father was President of the "National" itself. (Applause.) That is 30 years or so ago. I appreciate your kind action very much, the more so as during the last few years I have not taken a very active part at the meetings of the Association, chiefly on account of the fact that I have had such difficulties in obtaining a satisfactory assistant, which I am glad to say I have now achieved, as my inability to secure such was a very great tie to me. Previously, however, since the War, I was Secretary and President.

I am always very deeply interested in the Association as my grandfather was one of its founders and my father a very ardent worker and keenly interested.

We have a big responsibility on our shoulders this year in connection with the Congress and I firmly believe that we shall carry this responsibility with success; at all events I shall do my utmost to ensure it. (Hear, hear.)

It is very gratifying indeed to see the improved attendance and enthusiasm which has existed recently, largely due to the untiring efforts of our Secretary, to whom we owe a great debt of gratitude, and to the efforts of the past Presidents. (Applause.)

To-day we are competing for the Shipley cup, for which an entrance fee of no fixed amount is due. The proceeds are devoted to that very excellent Victoria Veterinary Benevolent Fund for which my father was at one time the prime mover and for many years Hon. Secretary and Treasurer; I hope that everybody will feel generously disposed to-day as the finances of the Fund are sadly deficient and it is such

contributions as these which help them considerably.

Our own particular efforts towards the Congress are, as you know, the reception, to be held in conjunction with the Lincolnshire and District V.M.A. on the Sunday evening and a musical entertainment to take place following the Banquet, details of which are being discussed under another minute. The *post-mortem* demonstrations are to be held at my premises and I have arranged for tea to be provided, as a movable feast when inclination points that way, in an assembly room immediately opposite my premises.

I hope that I shall have a successful term of office and in return for the honour that you have conferred upon me I offer my services in any direction in which you may feel inclined to call upon me. (Loud applause.)

Bowls Tournament.—After the business meeting members and their ladies partook of tea in the lovely gardens at "Beechcroft," after which the Bowls Tournament for the Shipley cup was played.

This popular event gave rise to the usual keen competition and ended in a popular win for the President, who beat the Hon. Secretary in the finals. As a result of this, £10 was sent to the Victoria Veterinary Benevolent Fund. The meeting concluded with a hearty vote of thanks to the President and Mrs. Shipley for their hospitality and all they had done to make the meeting such an unqualified success.

H. P. Standley, Jun., *Hon. Secretary.*

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Scottish Metropolitan V.M.A.*

MEETING AT PERTH

A general meeting of the above Division was held on Wednesday, June 28th, 1939, at 2.30 p.m., in the Station Hotel, Perth.

Mr. J. N. Ritchie (President) occupied the Chair, and there were also present: Professor G. F. Boddie, Messrs. A. Brownlee, D. Cameron, H. F. Downie, J. D. Ferguson, Dr. W. S. Gordon, Mr. W. Harris, Dr. H. H. Holman, Major T. M. Inglis, Messrs. J. Macfarlane, F. J. V. Mayne, Professor W. M. Mitchell, Sir Arthur Olver, Mr. U. F. Richardson, Major A. Spreull, Dr. J. Stewart, Messrs. A. W. Taylor, D. R. Wilson, H. M. Wilson and the Hon. Secretary. Messrs. S. R. Campbell, W. Watt and G. T. Weir were present as visitors.

Apologies for absence were received from Mr. W. Anderson, Major A. Baird, Professor H. Dryerre, Dr. J. Russell Greig, Messrs. A. Gofton, A. B. Kerr, H. B. Luxmoore, W. Nairn, Major J. G. MacGregor, Major D. S. Rabagliati, Messrs. A. L. Robertson, F. J. H. Sewell and A. R. Withers.

The minutes of the previous meeting, which had been published in the *Veterinary Record*, were taken as read and approved.

Correspondence

The following correspondence from the General Secretary, N.V.M.A., was then considered.

1. *Representatives to General Council, N.V.M.A., for the Year* 1939-40.—After discussion, it was decided, on the motion of Major Spreull, seconded by Dr. Gordon, to re-appoint the present representatives, *viz.*, Professor Mitchell, the President and the Hon. Secretary.

Arising out of the discussion, the President mentioned that the Council had been considering the question of payment of members' expenses and desired to have the guidance of the general meeting in the matter. After discussion of the financial position of the Division it was moved by Professor Boddie and seconded by Dr. Gordon, that the meeting approve in principle of the Division making a contribution towards the travelling expenses of members serving on the more important Committees of the "National," the decision of the amount available and its allocation to be left to the Council to decide in the light of financial circumstances prevailing.

2. *Collaboration between the Profession and Animal Welfare Societies.*—At the request of the President, Professor Mitchell outlined the general scheme for co-operation between the profession and the R.S.P.C.A. and S.S.P.C.A. He also described briefly the present situation with reference to the P.D.S.A.P.

After discussion it was decided that no further action was necessary in the case of the scheme for collaboration with the R.S.P.C.A. and the S.S.P.C.A. With reference to the negotiations between the R.C.V.S. and the P.D.S.A.P., the following resolution moved by Major Spreull and seconded by Mr. H. M. Wilson, was carried unanimously:—

> "At this, the first meeting of the Scottish Metropolitan Division since the meeting of the Council of the Scottish Branch held in Glasgow on March 23rd, 1939, the members confirm their agreement with the resolution adopted on that date, *viz.*:—
>
> 1. A working agreement with the P.D.S.A.P. is desirable in the best interests of the Veterinary Profession, the P.D.S.A.P. and the animals of the poor.
>
> 2. The Branch attaches the greatest importance to the arrangements to be made for the proper selection of the

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cases to be referred to the Veterinary Surgeon by the Technical Officer of the P.D.S.A.P.

3. The Branch views with concern the position in which the Veterinary Surgeon would appear to be placed of having to accept cases, the diagnosis of which had already been undertaken by an unqualified person.

4. The Branch is of the opinion that before an agreement can be reached, which would be acceptable to the Profession as a whole, further detailed discussion would be necessary at which the Council of the N.V.M.A. should be adequately represented."

3. A letter from the General Secretary requesting information from any member who had experience of "Abortion remedies." It was decided to leave this matter to individual members.

Nomination.—Major Grahame Williamson, Royal (Dick) Veterinary College, was nominated for membership of the Division by the President, seconded by Dr. Gordon.

Election.—On the motion of Mr. H. M. Wilson, seconded by Mr. H. F. Downie, Messrs. H. B. Luxmoore and J. Ralston were elected to membership of the Division.

Presidential Address.—The President, Mr. J. N. Ritchie, then gave a short address which was greatly enjoyed by all present.

Short Papers.—1. Professor G. F. Boddie gave a short paper entitled "A Note on the Differential Diagnosis of Paraplegia in the Dog," which was amply illustrated by X-ray films and specimens and which proved extremely interesting to the members present.

2. Mr. D. R. Wilson then gave a short communication on "The Cultivation of Viruses," which was very enjoyable and provoked considerable discussion.

At the conclusion of the discussion, Mr. W. Harris moved a vote of thanks to the speakers which was carried with acclamation.

Any Other Business.—Mr. T. M. Inglis proposed that there should be recorded in the minutes of the Division sincere sympathy with the family of the late Sir Frederick Hobday and that the Secretary should be instructed to send an excerpt from the minutes to Lady Hobday. This was seconded by Major Spreull and Sir Arthur Olver and carried unanimously.

After the meeting members and their ladies were entertained to tea by the President and Mrs. Ritchie. At the conclusion of the tea, Dr. Gordon moved an appropriate vote of thanks to the President and Mrs. Ritchie for their hospitality.

A. Robertson, *Hon. Secretary.*

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Sept. 11th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

Sept. 20th.—Applications due for Miss Aleen Cust Veterinary Research Scholarship.

Oct. 4th.—R.C.V.S. Committee Meetings.

Oct. 5th.—R.C.V.S. Committee Meetings.

Oct. 6th.—R.C.V.S. Committee Meetings and **Council Meetings.**

Nov. 1st.—All changes of address to be reported to Registrar, R.C.V.S.

Nov. 6th.—Provisional commencing date of Animal Management Examination.

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Emergency Locations

Royal College of Veterinary Surgeons.—The offices of the R.C.V.S. have been temporarily transferred to 30, Park Lane, Wembley, Middlesex. Telephone: WEMbley 5049.

National Veterinary Medical Association.—The N.V.M.A. is carrying on for the time being at 36, Gordon Square, W.C.1. Urgent Association business is being transacted but the entire staff, including the Honorary Officers of the Association in London, are engaged full time upon the scheme being developed under the National Air Raid Precautions for Animals Committee and Colonel Stordy. It will be remembered that the Head Offices of the N.A.R.P.A.C. are at 36, Gordon Square, W.C.1: owing to the voluntary nature of the scheme this organisation has no staff of its own.

Royal (Dick) Veterinary College.—We are advised that the "Dick" College is to continue at Summerhall, Edinburgh, 9. It has also become the headquarters and main centre for the N.A.R.P.A.C. organisation for Edinburgh and Leith.

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A.R.P. FOR ANIMALS

N.A.R.P.A.C. Booklet

In connection with the material relative to the protection of animals in air raids, with special reference to chemical warfare, published in recent issues of the *Veterinary Record* and collected also from other sources, a booklet has been prepared, and is being issued by the N.V.M.A. on behalf of N.A.R.P.A.C., embodying the following features amongst numerous others:—

Air Raid Protective Devices for Animals.

The Effects of War Gases on Animals.
Tabular Statement of information, amplified by additional data relative to detection, treatment, etc. This may be obtained separately (price 1½d., post free) in a form suitable for mounting on board for display in surgery.
The Horse in relation to Air Raid Precautions.
A.R.P. on the Farm.
Protection of Household Pets.

The booklet may be obtained on application to the National Veterinary Medical Association, 36, Gordon Square, W.C.1, price 4d., post free.

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UNIVERSITY RECRUITING

Guidance for Graduates and Undergraduates

At all universities joint recruiting boards are being set up. The purpose of these boards is to ensure that the best use is made, in the interests of the State, of the services of resident graduates and undergraduates who offer their services.

Those wishing to offer their services should apply in writing to the joint recruiting board at their university, stating: (*a*) Date of birth; (*b*) Service, and branch of that Service, or other national work, for which the candidate has a preference, stating qualifications; (*c*) Technical, academic, or military certificates, degrees, etc.

Applications should await instructions before reporting in person to joint recruiting boards. Those already serving in the ranks of any of the Defence Services are being dealt with separately and will not apply to joint recruiting boards. All other resident graduates and undergraduates who wish to offer their services should apply to the joint recruiting board at their university rather than direct to the recruiting organisation of one of the Services.

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PERSONAL

Births.—Halford.—On August 16th, 1939, at Inniskeen, Station Road, Mickleover, Derby, to Oline, wife of Godfrey J. G. Halford, M.R.C.V.S., D.V.S.M. (Vict.), a son.

Perry.—On August 18th, at Dunolly, Overnhill Road, Staple Hill, Bristol, to Mary Whitaker (*née* Taylor), M.R.C.V.S., wife of Victor Evan Perry, M.R.C.V.S., a daughter.

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R.C.V.S. OBITUARY

Aitken, John James, of The Hawthorns, Chester-le-Street, Co. Durham. Graduated North Edinburgh, January 4th, 1888. Died September 3rd, 1939, after a long illness.

Eccles, Arnold, of Pirbright, Woking, Surrey. Graduated Glasgow, December 15th, 1923. Died August 30th, 1939.

Hill, George Campbell, 774, Gallowgate Street, Glasgow. Graduated Glasgow, April 22nd, 1876. Died August 27th, 1939.

INTERNATIONAL CONGRESS OF GENETICS

Livestock Improvement

At the opening plenary session of the seventh International Congress of Genetics held recently in Edinburgh, Professor Crew, of Edinburgh, was elected as President in place of Professor Vasilow, the Russian delegation having withdrawn in spite of the honour assigned to him.

Sir Robert Greig, former Secretary of the Department of Agriculture for Scotland, who presided over the section devoted to livestock improvement, said that the science of genetics was going to make it easier for the stock-breeder to recognise and avoid mistakes which could be made in animal breeding.

He declared that the subject of their discussions was appropriate to this country because during the last 100 years or more a good deal of livestock improvement had taken place in Scotland. That improvement had been brought about by exceptional men who had exceptional powers of observation, and of deduction from their observations. These exceptional men produced some exceptionally good animals and these animals being exhibited at various agricultural shows and under conditions of competition greatly educated the eye of the general stock-breeder. In this way improvements were made in Scottish livestock. The Department of Agriculture for Scotland and England had accelerated the possibility of improvement by various means —by organising livestock breeding societies, by providing premiums for stallions, bulls, and boars, and such a way as through the Bulls Licensing Act.

Sir Robert also referred to the helpful influence of the Agricultural Colleges for organising livestock judging competitions, which were undertaken by teams from various colleges and more recently by teams from Young Farmers' Clubs.

Associated with the improvement of livestock in Scotland were such figures as Cruickshanks, Duthie, M'Combie, and various others, whose names would be remembered as long as breeders took an interest in the improvement of livestock. But these men were not scientific men, and therefore it was inevitable that for every outstanding animal they bred there must have been a considerable number of misfits.

In conclusion, Sir Robert said it was now hoped that with the science of genetics they were going to make it easier for the breeder to recognise and avoid the mistakes which could be made in animal breeding. They hoped that this science was going to give a certain security to the breeder.

The first speaker in a discussion on livestock improvement was Mr. Hugh C. M'Phee, Washington, U.S.A., whose subject was "Recent Attempts to Co-ordinate Genetic Research on Farm Animals in the United States." He said that much had been written and spoken of the value of genetic research as the basis of livestock improvement, but little had been accomplished. No genetic experiment had been carried on with farm livestock which gave a critical test of the limitations of improvement possible by intense breeding accompanied by selection of the progeny test; Goodale, selecting for body-weight in mice, secured within 16 generations some mice which were twice the average initial weight.

"In applying this technique to farm livestock, it must be remembered that our breeds have already been subject to intense selection, and some of the possibilities of improvement have

already been secured, but most of our selection has been phenotypic—not genotypic, and it is therefore not possible to forecast results from similar experiments in swine, sheep, or cattle.

"Variations in farm livestock are important. Selection on a genotypic basis for weight alone may result in a large type, heavy-boned, narrow-chested, slab-sided pig. Thus genotypic selection must be based on more than one character at a time.

"There is a close association between the degree of improvement in different forms of livestock and the ease with which their productive characters can be measured. Thus greatest progress has been made with dairy cows and laying hens. For meat animals the show-ring is not an exact standard, but at best it is only phenotypic.

"It is not necessary to know how many genes are concerned before progress can be made. Accordingly the U.S.A. Government are working on a large-scale experiment to resolve the problem of these immeasurable qualities. The Regional Laboratories established by law in 1935 are described in general and in detail for swine, sheep, and poultry. Although progress to date does not justify publication of results, the work is under way on a scale which will guarantee significant results."

Mr. G. Bonmer, Sweden, read a paper on "Theoretical and Practical Possibilities of Genetics in Contributing to the Improvement of Livestock."

He said the improvement of livestock depends on the selection of those animals for parents whose progeny will be the best possible. Selection can only be effected when the observed differences are genotypic. If differences are due to nutrition, selection is not effected. To-day precision is required as to the effects of heredity and environment. These may be distinguished by statistical methods. This gives a survey but cannot be so definite as experiment.

Conditions due to environment causes were discussed and the importance of environmental factors during the growth period was stressed as the major cause of variation. Monozygotic twins were invaluable for such an examination.

The effect of sex-linked genes was described, using an example from the cross White Leghorn by White Wyandotte, which gives much better results than the reciprocal.

Genetics and Animal Breeding

Mr. W. K. Hirchfield and Mr. G. M. Plank, Utrecht, Holland, dealt with "Genetics and Animal Breeding." It was remarked that research work might be based on either a study of pedigree or deliberate experimentation, the latter being preferable, but limited owing to their cost. The dangers of the pedigree method were outlined. It was claimed that recent attention to the inheritance of productive characters had led to overlooking the inheritances of pathological ones. The question was, must a family or group of high production value be sacrificed in order to throw out pathological hereditary aberrations? Test services of males with homozygous recessive defective females was recommended.

Dealing with the question of resistance to disease, it was remarked that this probably existed but it had not yet been proved for European cattle. There were also genetic differences in the food requirements for different animals. In respect of the inheritance of productive characters, analysis was extremely difficult. The value of the progeny test was emphasised, but the analysis of breeding factors along the lines suggested by v. Patow was also of value and was an important method for the improvement of cattle. The use of such an hypothesis, though it might not be absolutely correct, was of great practical benefit, but the adopted symbols should never be regarded as representing genes.

Mr. A. L. Hagedoorn, Holland, dealt with the question of the concentration of effort in selection by means of the nucleus plan of breeding farm livestock.

In the course of his remarks the speaker said: "The two chief objectives in selection are a constitution which makes the animal yield a profit over expenditure, and uniformity within the groups, *i.e.*, homozygosity in respect of valuable genes and absence of undesirable ones. Breeders are now awakening to the need of selecting according to genotype: progeny testing has come to stay. But the change to the safer selection according to genotype means a complete revolution in animal breeding.

"In plant breeding, the efforts in selection for the production of commercial seed are concentrated on a very small nucleus, the progeny of a very few progeny-tested individuals, the 'elite' seed propagated for sale and agricultural use.

"In reorganising the breeding of livestock, we should avoid letting the effect of progeny-tested highly homozygous and very desirable males on the breed as a whole be swamped by making them compete in their own generation with untried males.

"A plan which I have called the 'nucleus scheme' is intended to take the place of the existing more or less haphazard efforts in animal breeding. It consists in the following. A number of breeding males are judged according to the quality of their progeny, care being taken that a random sample of their progeny is examined. Males heterozygous for lethals are rejected, and only a few males are chosen that have produced only highly valuable offspring. Really important qualities are given precedence over show points of speculative correlative value. The male breeding stock is the exclusive product of those few sires. The rate of reproductoin determines whether the males used will be only the sons (*e.g.*, in pigs), or the sons and grandsons (*e.g.*, in cattle) of the tested nucleus sires.

"The nucleus scheme serves to concentrate the efforts in selection in the hands of a very few specialists who will have a virtual monopoly of the production of male breeding stock. Isolation of the nucleus protects it against the introduction of harmful lethals and unwanted recessives. It entails a certain amount of inbreeding, with all its benefits and none of its disadvantages. It can be adapted to the present breeding scheme, where a relatively small number of pedigree breeders produce most of the male breeding stock by substituting progeny tests for partial reliance on show points and the individual quality (phenotype) of the sire's dam. Herd book societies should co-operate with geneticists to put the breeding of farm livestock upon a rational basis so that this revolution in methods will work out smoothly and effectively."

At the plenary sectional session devoted to gene and chromosome theory, much attention was given to the problem of mutations. Professors Stadler and Muller reported that ultra-violet radiation produced different kinds of mutational change from those due to the customary X-ray treatment. The latter outlined experiments which might eventually be able to distinguish between true mutation, in the shape

of alteration of a single gene, and changes due to minute rearrangements of chromosome sections.

Dr. Ressoisky, of Berlin, reminded his hearers that the cause of spontaneous mutation was yet to seek, cosmic rays being far too weak to produce the results observed. It would appear probable that important advances in our understanding of hereditary change and its control may be anticipated in the relatively near future.

In the section of human heredity a paper was read by Dr. Penrose, and other papers were given by Dr. Lundholm, of Sweden, Dr. Nachtsheim, of Berlin, Dr. Sanders, of Holland, and Professors Lenz and Hartmann (both of Berlin).

Genetics in Physiology

In the section of physiological genetics, a plenary session was devoted to discussing how hereditary factors exert their visible effects, and Professor Wright, of Chicago, showed the immense complexity of such a comparatively simple matter as the production of the various coat-colour patterns of guinea-pigs. Professor Baltzer, of Berne, and Professor Wellstein were others who contributed papers.

A plenary session was also devoted to genetics in relation to evolution and systematics. Dr. Dolzhanstey, of California, summarised recent researches, and Professor Tischler, of Kiel, spoke on the subject of plant life.

Dr. Julian Huxley discussed the different kinds of natural groups (species, sub-species), pointing out that they differed in their properties according to the nature of the organisms concerned, and thus polyploidy, so common in plants, was very rare in animals.

(*To be continued*)

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LEGAL NOTES

A Quack Animal Doctor.—On August 16th a quack animal doctor was summoned by the R.S.P.C.A. at the North London Police Court for causing unnecessary suffering to a cat by treating it in an improper manner. He was fined £2 and ordered to pay four guineas costs.

It was stated that a man took his cat to the defendant for treatment because it was lame, and that the defendant found that the left front leg was broken. He agreed to set the leg for a fee of seven shillings and sixpence, but when the owner fetched the cat it had a plaster bandage on the right hind leg. The defendant, it was said, told the owner that it was the right hind leg which was injured.

As the cat did not get any better the owner twice took it back to the defendant and then consulted another unqualified man, who told him that the case was serious and he had better see a veterinary surgeon. He did so, and the veterinary surgeon found that the trouble was due to gangrene and ordered that the cat should be destroyed. The veterinary surgeon afterwards found that there had been no fracture and that it was because the bandage had been put on badly that the leg had become gangrenous.

For the defence it was alleged that the left front foot of the cat was fractured. The defendant declared that he had set the left front foot and he denied that he had placed a bandage on the right hind leg. He suggested that some unknown person had put on the bandage or that another cat had been substituted for the one he treated.

COUNTY WAR AGRICULTURAL COMMITTEES

The Minister of Agriculture and Fisheries has appointed a War Agricultural Executive Committee for each County in England and Wales and has made an Order (the Cultivation of Lands Order, 1939) authorising these committees to exercise on his behalf certain powers conferred on him by the Defence Regulations for the purpose of increasing home food production in time of war.

In a circular letter to the committees the Minister states that they will be given as free a hand as possible to proceed as a matter of urgency with all possible steps to increase the production of foodstuffs in their areas. Their immediate task is to see that additional land is brought under the plough with all speed.

The aim is to obtain for next year's harvest an increase of about one-and-a-half million acres in the tillage area in England and Wales compared with the acreage in June last. Each county has been allotted its share of this total, and the committees have been urged to see that every effort is made to complete their allotted tasks—and, if possible, to exceed them.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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TEACHING OF VETERINARY ANATOMY AND PHYSIOLOGY: THE TYPE ANIMAL

To the Editor of the Veterinary Record

Sir,—In your issue of August 19th there appeared a communication regarding the above subject signed by A Fellow, A Member and A Student suggesting that a ruminant, preferably a cow, should be the "type animal" for anatomy in preference to the horse or dog. A further communication signed by Maurice Kirk appeared in your issue of August 26th in support of this contention. The writers of these communications do not claim any special experience of teaching anatomy nor do they put forward reasons in support of their contention beyond the statement that the domesticated ruminants are assuming a position of rapidly increasing importance, both in health and disease, to the veterinary profession. Furthermore, they have not put forward any evidence to show that the teaching of the anatomy of ruminants under the present syllabus is in any way inadequate to meet the necessary requirements even under the recent developments of the State Veterinary Service.

It must be admitted that a detailed knowledge of anatomy is most necessary where it has an application to surgery and to the diagnosis of lameness and also to the examination of animals for soundness. In this connection the horse still holds the premier position and, although reduced in numbers in recent years, a detailed knowledge of his anatomy is still indispensable to veterinarians. Some courage is necessary even to suggest that the student should dissect the limbs of the ruminant or of the dog in preference to those of the horse and go forth into the world

as an expert in the diagnosis of lameness and in the examination of horses for soundness. Apart from this aspect of the question the horse is an ideal subject as the standard animal from the point of view of his general structure and simplicity of dissection.

The dog would be more easily procurable but this is the only argument in favour of adopting this animal since his dissection would be much more difficult for the student and under present conditions the student acquires quite sufficient general knowledge of the anatomy of the dog to meet all the requirements of recent advances in canine surgery.

The Royal College of Veterinary Surgeons would be well advised to "leave well alone" and to make no further changes in the teaching of anatomy without very strong reason, for some of the changes which have been made in the past have not proved to the advantage of the subject. After 24 years' experience of teaching this subject the writer can state without hesitation that during the days when two examinations were held in anatomy the average student had a much better general knowledge of the subject than obtains to-day. Under that system the student studied the bones and ligaments in detail with a view to passing his examination in this part of the work at the end of the first year. During the second year the student and teacher were relieved of the obligation of repeating the first year's work and were thus enabled to concentrate on the study of the soft structures with the result that the average student finished the second year with a very sound general knowledge of the whole subject of anatomy. This system facilitated both teacher and student.

The whole subject of anatomy is simply too wide for one examination with the result that certain parts of the subject become pushed into the background, especially when the student has two other major subjects to study in the same year. Such parts as the bones of the skull, the general comparison of the bones, the anatomy of the brain and certain necessary details are now given, by the average student, what he describes as a "miss in baulk," because he is aware that in such a large subject he will pass his examination with his knowledge of the more general part of the work. Furthermore, there is always the tendency for the average student to cram the major part of his anatomy into the second year's work. When the examination in osteology was dispensed with the reason given for this action was that the skeleton should not be studied before, but in conjunction with, the soft parts. This reasoning has always been beyond the comprehension of the writer, for a student who commences to dissect any part of the body without a thorough knowledge of the skeleton of that part is simply approaching his work "upside down" and he is comparable to the house-builder who erected the roof first and devoted his energies to holding it up while the walls of the house were being built. It does not require much imagination to realise that a knowledge of the framework is the first essential in the study of any structure.

My suggestions are that anatomy should be taught and examined (by two examinations) in the first and second years, exactly as obtained in the old four-year course. The subjects of the second, third and fourth years as suggested in the revised syllabus (in the last annual report of the Royal College of Veterinary Surgeons) should be rearranged in order to reduce the excessive amount of work which it is proposed to put into the second year and thus avoid over-taxing the student in his second year examination.

I am, Sir,

Yours faithfully,

T. G. Browne,
Professor of Anatomy,
Veterinary College of Ireland,
Dublin.

August 28th, 1939.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT OF 1937 (PART IV)

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th Aug., 1939	17	20	—	—	—	1	7	110	90
Corresponding period in 1938	26	321	—	—	—	—	2	33	35
1937	15	17	4	827	1	1	2	34	11
1936	16	19	—	—	2	2	7	71	33
Total 1st January to 15th Aug., 1939	527	575	44	5,623	31	71	164	1,449	994
Corresponding period in 1938	561	913	157	20,261	42	70	107	410	302
1937	472	573	19	4,473	88	125	133	722	438
1936	304	360	4	379	82	223	154	1,303	927

Note.—The figures for the current year are approximate only.

§ Excluding outbreaks in Army Horses.